

Inductive Proximity Sensors — Diameter, Sensing Distance, Flush Mounting, PNP/NPN and NO/NC Explained

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The five choices that specify an inductive sensor — barrel size, rated sensing distance S_n , flush or non-flush mounting, output transistor type (PNP/NPN) and switching function (NO/NC) — with the correction factors for target material and the catalogue's OsiSense XS size ladder.

How it works, in one paragraph

An inductive sensor drives a coil in its face with a high-frequency oscillation; a metal target entering the field absorbs energy by eddy currents, the oscillation collapses, and a threshold stage switches the output. No contact, no wear, immune to dirt and oil — which is why inductives are the default position sensor on machinery wherever the target can be metal.

Choice 1 — size and sensing distance

Rated sensing distance S_n scales with coil (barrel) diameter. The catalogue's OsiSense XS general-purpose ladder:

Barrel | Typical S_n (flush) | Example |

Ø6.5 mm smooth | 2.5 mm | XS106B3PAM12 |

M8 | 2.5 mm | XS108B3PAM12 |

M12 | 4 mm | XS112B3PAM12 |

M18 | 8 mm | XS118B3PAM12 |

M30 | 15 mm | XS130B3PAM12 |

26×26 / 40×40 / 80×80 blocks | 10 / 15–20 / 40 mm | XS7E 26×26, XS7D 80×80 |

Design the mechanics for an operating distance of $\sim 0.8 \times S_n$ at most — mounting tolerance, temperature drift and target run-out eat the rest. S_n is defined on mild steel; correction factors reduce it on other metals (stainless roughly $\times 0.7$, brass/aluminium $\times 0.4$, copper $\times 0.3$ — per-model data sheets govern).

Choice 2 — flush or non-flush

A flush-mountable (shielded) sensor can sit with its face level in steel — robust, protected, but shorter S_n . Non-flush (unshielded) types need a metal-free zone around the face and reward you with up to double the distance. The catalogue names mounting condition per item; the "Optimum" compact series (XS508 Ø8, XS530 Ø30) are the cost-effective flush DC 2-wire line.

Choices 3–5 — electrical interface

PNP vs NPN: a PNP output switches the load to +24 V (load to 0 V) and dominates European PLC inputs; NPN sinks to 0 V and dominates Asian-built machines. Match the input card, nothing else. NO vs NC: NO closes on target; NC is chosen where a broken wire must read as "target present" for fail-safe logic. 2-, 3- or 4-wire: 3-wire DC is standard (brown +, blue -, black signal); 2-wire types (like the Optimum DC line) wire in series with the load and leak a small off-state current — check the PLC input accepts it; AC 2-wire versions (XS218 Ø18 AC) interface legacy 230 V circuits. Connection formats: M8/M12 connector or pre-wired cable (2/5/10 m) — see the connector reference.

Application notes

Switching frequency falls with size; counting fast small targets wants small barrels close, not big barrels far.

Mutual interference: identical sensors face-to-face or side-by-side need the data-sheet spacing (or alternating-frequency versions).

Environment: stainless-bodied (XS918R Ø18 stainless) for washdown/chemical areas; low-temperature TF versions (XS7F... TF) for freezer plants; weld-field-immune variants near welding.

Special functions: under-speed/rotation monitoring is a packaged inductive function — see the XSAV rotation monitors (6–150 rpm, 120–3000 rpm).

For targets that aren't metal — liquids, plastics, wood — step to capacitive (XT230 Ø30), ultrasonic or photoelectric sensing: the photoelectric guide maps those choices.

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